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# Sustainability Barriers in Nigeria Construction Practice

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**Abstract.** The struggles to practise sustainable construction are not gaining the desired traction in Nigeria. This study established the likely barriers to successful application of sustainable construction in the Nigeria construction industry and factors to overcome the possible barriers. A quantitative approach was used for the study and a questionnaire survey was conducted among the professionals and other stakeholders. A descriptive method was used in analysing the collected data. Among the highly ranked sustainability barriers to construction practice are poor sustainability education in academic institutions, lack of incentives for designers to facilitate sustainable design, ignorance of lifecycle cost benefits, sustainable construction regarded as low priority and other issues take priority, and resistance to cultural change in the industry. The research recommends adequate sustainability education in academic institutions to positively impact the required cultural change in the industry. There is call for proper government policies that support implementation of sustainable construction practices. The study also advances the need for construction professionals and stakeholders to embrace the concept of sustainability education through continuing professional development and or postgraduate studies to improve the thinking and practicability of sustainable practice of construction in Nigeria.

**Keywords:** Barriers, Sustainability barriers, Construction Practice, Professionals, Stakeholders

## 1. Introduction

Every construction endeavour involves burning of fossil fuels, gas emissions of carbon dioxide, methane and other waste products that pollute the environment including air, water, and noise pollution and destruction of natural habitats. According to [1] construction industry has been found to cause damaging effects to the environment by means of waste generation, energy and water depletion and several other forms of damage to the environment. These damaging effect of construction cannot continue and efforts must be made to curb it by making construction practice sustainable. Recently, nongovernmental bodies, academia and individuals are vigorously propagating sustainability awareness with the Nigeria government in order to promote commercial and professional interest as well as safeguarding the environment [2]. Implementation of sustainable construction practices has become a problem due to desire or courage and strategy which eventually resulted to less of awareness [3] also claimed that present construction practices are unsustainable, and not in agreement with ideal sustainability principles [4] have expressed the deficiency in efforts targeted at sustaining infrastructural development in Nigeria. Therefore, advocating for a more committed government effort and inclusive civil society participation. Sustainable development has been defined decades ago depicted in United Nations document chaired by Brundtland in 1987 as the ability to make development sustainable to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs [5], [6]. The concept of sustainable development



does imply limits. Sustainability within the construction sector has been a key theme globally and Nigeria is not left out among the developing countries of the world. The construction industry has the largest impact on the economy when compared with other industries [7]. These have shown the importance of sustainability in the construction practice in Nigeria.

Sustainable construction (SC) can be seen as a subdivision of sustainable development applied to the construction industry. It can be viewed as “the creation and liable administration of a healthy built environment based on resource efficient and ecological principles” [8]. The construction sector in Nigeria plays an important role in the development of our nation’s economy. The construction industry is said to have contributed about half of the total stock of fixed capital investment in the Nigeria economy [9]. The presence of Asian giant, the Chinese and Indian debar Nigeria construction industry not be the highest employers of labour [10]. The significance contribution of the construction industry in Nigeria cannot be outweighing in terms of socioeconomic development through the proportion of workers and acquisition of skills compared to manufacturing sector. The Nigeria construction industry contribution to the nation GDP has remain abysmally low despite the growth seen in the sector even with 1.4% of its GDP [11].

The influence of the construction industry to sustainability is a worldwide concern. Surprisingly, most organization in Nigeria has a narrow focus because their focus is on profit and not about those that will bring the profit. Development should be seen as the most important formation of any country [12]. However, the problems opposing developing countries are vast and much more complex than those affecting the industrialized world. According to [13] developed countries wanted to reduce the environmental impact of their growth while developing countries were desperate because they were not at similar higher levels of economic growth that industrialized countries had, thus using cheap methods with high environmental impact. Typical problems of developing countries include low income, poor water-supply systems, initial health systems, poor education and health systems, lack of trained human resources, finance and many others. Using healthier and resource-efficient models of construction, renovation, operation, demolition and maintenance will create sustainable building and green construction known as green building [14]. Healthier and eco-friendly environment are encouraged by this process and is undertaken with the greatest possible level of cooperation and coordination of engineers, contractors, design team, and landlords throughout the project in question. The construction industry is characterized by complex socio-cultural, contextual, structural issues as reflected by its primary resistance to change. A considerable need to move from the native construction system to sustainable construction practice is to eradicate the deficiency in authoritative research in order to understand the current barriers to sustainable construction practice in Nigeria through the lens of stakeholders [15]. However, Nigeria construction process has been faced with challenges and priorities that are completely different from those of a lot of advanced countries. Despite the fact that significant research has revealed different practices and techniques to improve the sustainability of construction, the construction industry seems to be unwilling to apply most of these methods [16].

The quantity of the research focused on this topic, efforts and investments to conduct it, potentials evolving in SC needs to be investigated as to why the owners and developers do not seem to be interested enough to apply the outputs of the research in their projects [17]. This could be attributed to some barriers in the industry that limit the application of the new sustainability guidelines. As an example, cost constraints are the dominant factor while making decisions in the construction industry [18]. The Nigerian construction industry is characterized by construction companies starting from the little and medium enterprises, to the big enterprise and technically competent international construction companies. The government of Nigeria believed more in foreign corporation leaving indigenous contractor with fewer options in terms of execution of construction jobs [19]. This has become a barrier to sustainable construction practice in Nigeria. Government accounts for being the biggest consumer of the trade although, Nigeria recorded magnificent patronage from several private firms within and outside the globe.

[20] proposed that barriers may cause undesirable penalties which are not supportive of organizational aims. He then characterized the barriers into two groups; the barrier with lesser effect and the ones

with greater effect. A suggestion was made for every individual or stakeholders of SC to focus on identifying and acting on the higher effective barrier (root causes) with respective to time. [21] revealed that the major barriers to sustainable construction practices in Nigeria include sustainability knowledge related, regulation and policy related, sustainable materials and technology related, and information and management related. The construction project needs a good management to achieve the satisfied result including efficient satisfaction, appealing satisfaction, accomplishment on time, completion within budget, value for money, and health and safety. Despite the continuous growth in the Nigerian Construction Sector Summary Report 2010 –2012 which has indicated dynamisms of development [22] lack of expertise and professional knowledge; lack of strategy to promote sustainable construction; Lack of demand; Lack of legislation, enforcement and monitoring; and Lack of government incentives are considered to be significant barriers affecting the growth of sustainability in Nigeria [15]. However, projects that are implemented in various developing countries have been linked to poor sustainability in declarations made in recent times, in which the Nigerian construction industry is not an exemption [21]. [23] submitted that the most prevalent barrier was the lack of information that would allow practical implementation of practices, clarify the reasoning behind the need for these practices and the benefits to the trade. This study identifies the barriers to construction practice which would help to understand the barrier and implement the development of strategies to reduce its implications in the country. The results of this research aim at providing insights on the measures to improve and advocate sustainable construction practice in Nigeria.

## 2. Literature Review

Sustainability has a generally accepted pattern in the industry in that human activities are major cause of the depletion in the quality and standards of infrastructures. The development that presents infrastructures with the ability to serve both the needs of the present and the future was viewed by World Commission on Environmental Development such as [5] and [13]. Nigerian construction industry has faced various disregards and misconception due to its recorded low level of input and has caused contractors in the industry to be reprimanded of constructions that envisage on a large and bulky gauge [24]. This has resulted to a reputation in poor project management due to reasons such as bungling of funds, provision of capital, and abandonment of projects [19]. When challenges are clearly understood, the construction industry decision makers should cooperate to develop practical solutions to overcome these challenges.

Researches have been carried out and have focused on weighing the drivers and barriers of sustainable construction in construction industries globally but with limited factors compared to many available factors identified in this research [25]. It is known that on a global scale, construction industry has a variable impact on the depletion of natural resources, air, water pollutions, deforestation and global warming [26]. Some would argue that the view of sustainability is probably said that it is mostly associated with environmental protection. In as much as it is true, some other factors which are as a result of socio economic reasons cannot be left out as [13] posited that these environmental challenges were intertwined with economic and social conditions. In essence to producing a better impression, the notion of sustainability ought to be reflected as an all-inclusive and integrative approach [27].

In addition, half of the resources used by humans is mostly consumed in construction activities; half of the world's fossil fuel have been used to serve buildings, 37% of the world's total energy is used in construction activities, conversion of about 6500 hectares of rural land to urban of land [28]. The inability of the Nigerian construction industry to astutely practice sustainability of construction at an acceptable standard is linked to the unawareness and ignorance of construction parties such as; Engineers, Contractors, Architects and sometimes the clients [29] as the world realized the importance to create awareness of the need for sustainable development [13].

[30] made a comparable analogy about the drivers and barriers of sustainable construction in Kuwait where it was observed that the main cause is as a result of the lack of awareness of the concept of sustainability by within the country. Nevertheless, it is not the same in a research carried out in the Ethiopian construction industry where awareness of sustainability is ascertained across the industry. This implies that even at its awareness, sustainability needs to be practiced well and accurately. New

methods and tools of checking with the sustainability practiced in construction industries across the world is been used in developed countries [31] but the professionals still perform below expectation. Although, the necessities of moving toward SC has made promising development in the recent years and will still continue to be having impact in the construction industry.

The successes are not sufficient to reverse the negative environmental impacts on the built environment in developing countries [32]. Identifying the barriers to sustainability in construction, specifically from the view of private owners is essential to quicken the pace towards achieving the goals of sustainable construction [33].

The most petrifying barrier to sustainable construction is its inability to actually practice the methods of sustainability. The lack of the ability to perform sustainability of construction further infects the process of maintaining a structure [25]. Consultants and experts would boast of the ability to practice traditional construction, but when asked to address sustainability brings a sudden decrease in their morale. This implies that the understanding of common sustainability process affects the capacity of professionals in developing countries [34].

The challenges affecting sustainable construction must be elucidated if the concept of sustainability is to be enforced. The implications of these challenges are seen across various sectors of the construction industry thus affecting sustainability. In the Palestine, study revealed that the major challenges faced when practicing sustainable construction are; management, skill acquisition, financial constraints and customer's satisfaction [35]. The management skills can further be classified as to skills for coordinating, planning, labelling, motivating and staffing.

All the concept and attributes of a manager can be a deficit to the implementation of sustainable construction. The financial constraint is coined with the clients not allocating funds at the proper time or the extravagance in the management of funds by the project account officer. High investment cost, high capital cost amongst others is a probable reason for challenges facing sustainable construction. [3] It is paramount we realized that to practice sustainability in construction, a repeated method and approach would be entertained and the construction industry must be ready to embrace new technological methods and innovations that would counter its former methods of practice [36].

There is a long way to go if conventional wisdom is still being used to achieve a sustainable construction industry and this process needs an input from all industry stakeholders; however, it is important to know the current situation at the starting point. Despite the similarity in findings of previous studies worldwide, the situation in each country differs due to its sui generis socio-economic-politic context which requires attention [37]. The perception of sustainability is that it only concerns environmental protection in the current body of knowledge [38].

However, other elements of sustainability, such as economic and social, cannot be ignored and, therefore, the concept of sustainability should be considered as a holistic and integrative approach in order to keep a balance between the three elements. Physical facilities provided by construction industry such as dams, roads, bridges, residential and commercial buildings, factories, recreational facilities amongst others have significant effect on society, environment and economy [39]. Hence, construction industry plays a significant role in the balance between the three elements of sustainability compared to other industries, and it is strongly recommended that rather than traditionally used measures focusing on time, cost and quality the industry's success must be considered based on the triple-bottom-line [40].

For effective implementation of sustainable construction, it is important to identify possible drivers and constraining factors at the beginning, so that frontline industry professionals (government authorities, contractors and project managers) can successively act upon them professionally [41]. It is very crucial to identify the factors as identified in Table 1 (both negative and positive) influencing sustainable construction [42]. This will facilitate the adoption of those that have a positive effect and in the elimination or control of those that have a negative effect. In addition, a robust backing from the literature in order to achieve the aim of this study which is how to improve and advocate sustainable construction practice in Nigeria. This is done because of the gap in the research conducted on the subject in the Nigeria construction context; therefore, an international context is required to identify the barriers, and remove the factors that hinder implementation of sustainable construction.

**Table 1:** Overviews of the literature on the barriers to sustainable construction practice

Location	Reference	Findings
Canada	[16]	Lack of consideration of sustainability criteria in the evaluation of bids, unavailability of standard methods for procurement, lack of knowledge of local conditions, lack of explicit statutory requirements that cover sustainable procurement.
Malaysia	[43]	Lack of awareness on sustainable building, lack of training and education, the higher cost of sustainable building options, procurement issues, regulatory Lack of professional capabilities/designers, disincentive factors for local material production, lack of case studies/examples.
Chile	[44]	Lack of financial incentives, designers work alone, economic needs of higher priority, environmental costs not included in the cost structure, governmental bureaucracy, lack of knowledge on sustainable technologies, lack of environmental concern, affordability.
USA	[42]	First cost premium of the project, long pay-back periods from sustainable practices, tendency to maintain current practices, and limited knowledge and skills of subcontractors.
Finland	[34]	Steering mechanisms, economics, a lack of client understanding, process (procurement and tendering, timing, cooperation and networking), and underpinning knowledge (knowledge and common language, the availability of methods and tools, innovation).
UK	[45]	Affordability, building regulations, lack of client awareness, lack of business case understanding, lack of client demand, lack of proven alternative technologies, lack of one single labelling/measurement standard, planning policy.

Source: [41]

### 3. Research methods

Questionnaires can be an effective means of measuring the behaviour, attitudes, preferences, opinions and, intentions of relatively large numbers of subjects more cheaply and quickly than other methods. Local experts with international exposure helped review the variables used in the questionnaire. Their expert listing of variables from practice and literatures led the research to use of questionnaire that was used for data collection. This is to collate a quantitative degree of accuracy based on the opinions of professionals from different fields of professions. Such questionnaire assessments are carried out through a survey approach used in harnessing quantitative data from construction professionals that were selected based on their background knowledge in the management of construction projects.

A total of one hundred and fifty (150) questionnaires were distributed to professional firms using convenient sampling method. This was adopted in order to get timely response by avoiding stringent rules in the selection of respondents, regular cluster locations of professionals that are easily accessible and convenient for the researchers were explored for distribution of questionnaire with minimal cost.

The nature of the research as initial probe into awareness of sustainability plan among professionals in the Nigeria construction industry was another reason for adopting convenient sampling technique.

The selected firms have strong presence in the city of Lagos, which is the fastest growing city in the country and has the highest rate of procurement of buildings works. The design was aimed at determining the barriers to SC practices and how it can be improved in Nigeria. This survey was used to get vital information from all drivers on sustainable practice in Nigeria. A total of one hundred (100) questionnaires representing 67% response rate were successfully retrieved and used for the

analysis. A five point Likert scale was adopted, with 5 being strongly agree, and 1 being strongly disagree. The data gathered on the background information of the respondents were analyzed using percentage, while Mean and Standard deviation were used to rank the variable barriers. The population of the participating professionals is substantial compared to similar research in this regard particularly in the engineering.

#### 4. Results and Data Analyses

Background information from the total of 100 questionnaires received, result revealed 10% each of the respondents were Architect and Builder, 36% are Civil/Structural Engineer, 8% each practices as M&E Engineer, Project Manager, Quantity Surveyor, Material Supplier and Site Manager while 2% each practices as subcontractors. Majority of the respondents participated in the research study practices as professional Civil/Structural Engineer. Only 26% of the respondents participated in the study have between *1-5yrs* of professional working experience, with the remaining 74% having between 6-25yrs of professional working experience in the industry. All respondents have minimum academic qualification of Higher National Diploma (HND) or Bachelor of Science (B.Sc.) with 18% having Masters Degree and 7% having Doctorate degree. Importantly, all the respondents have professional qualifications which indicate that the respondents are experienced and well informed to provide the required information.

The extents of barriers in preventing the sustainable construction practices in Nigeria are presented in Table 2. According to the ranking, the ten most important barriers to sustainable construction practice are: Poor sustainability education in academic institutions; Lack of incentives for designers to facilitate sustainable design; Ignorance of lifecycle cost benefits; Regarded as low priority and other issues take priority; Resistance to cultural change in the industry; No input tariff for generation of renewable energy; Longer payback period for sustainable resources; Lack of government policies/support; Clients preference for the traditional materials; Insufficient integration and link up within the industry; Lack of commitment from professional bodies (such as NIA, NIOB, etc.); Poor awareness of the benefits of sustainability among the professionals; Limited knowledge of sustainability practices among contractors with the average mean of 3.70, 3.64, 3.58, 3.58, 3.56, 3.56, 3.54, 3.54, 3.52, 3.48, 3.48, 3.48 and 3.48 respectively. However, Sustainable construction does not raise market values of buildings is considered to be the least important barrier to SCP in Nigeria. Therefore, all the barriers are to be considered important as they affect the effective implementation of sustainable construction in Nigeria. There will be need for further research analysis to reassess any underlying causality among these barriers to see likely groupings and trimming down the barriers.

##### 4.1 Discussion

The findings of the research actually depict similar but different outcome in [17], [1] and [36] in Ghana, South Africa, and Zambia respectively with different weightings but similar emphasis on related factors. There are fewer variables in previous researches whereas there are fifty-eight variables identified in this research with more respondents than similar researches conducted in other developing countries. In Ghana [17] discovered that cultural change resistance, lack of government commitment, fear of higher investment costs, lack of professional knowledge, and lack of legislation are the leading barrier to implementation of sustainable construction in the Ghanaian construction industry. All these factors are among the agreed factors in Nigeria according to the outcome of this research however, the leading barrier differs as poor sustainability education in academic institutions ranked first in Nigeria against resistance to cultural change in the industry which was ranked fifth. The research of The two foremost challenges faced by South African construction industry towards the adoption of sustainable construction practices according to [1] are additional cost to building projects followed by limited understanding of the benefits of sustainable construction and of additional cost to building projects. These were revealed in this research as ignorance of the life cycle cost benefits (described as 'lazy view on additional cost to building projects' by [1] and poor sustainability education in academic institutions. Thus, the top two barriers in South African construction industry are among the top three



barriers in Nigeria while lack of incentives for designers to facilitate sustainable design emphasised in Nigeria but missing among the listed challenges to sustainable construction in South Africa. The latest in our literature review referenced is the work of [36] which revealed that the major barriers to sustainable construction practices in Zambia Construction Industry are; fear of higher investment costs, no local green certification available, lack of government policies or support, and lack of financial incentives. These four barriers can conveniently be related to the barriers ranked 37<sup>th</sup>, 35<sup>th</sup>, 8<sup>th</sup>, and 2<sup>nd</sup> (Table 2) in this research with the last two barriers; lack of government policies or support, and lack of financial incentives ranked within the agreed barriers. Professionals in Nigeria considered lack of supporting building regulations fear of higher investment costs, and lack of supporting building regulations (including no local green certification available) at middle course but tend towards agreed barriers that affect the sustainable construction practice similar to challenges being faced in Zambia, another developing country in Africa. Therefore, the challenges facing adoption of sustainable construction practice in developing countries like Nigeria is real and similar to other developing economies of African countries. In this research, none of the fifty-eight listed variable factors is disagreed as not being a barrier to sustainable construction practice thus, as these factors are agreed to be barriers to sustainable construction practice there is need to put additional research efforts to mitigating their impact for sustainable outcome.

The poor sustainability education in academic institutions in Nigeria negatively impacts the resistance to cultural change in the industry. This could exert more negative impact on the ignorance of the life cycle cost benefits or as lazy view on additional cost to building projects. Although, lack of supporting building regulations and fear of higher investment costs also featured among the agreed barriers that affect the sustainable construction practice, their impact will still trail behind more significant barriers that were revealed in this research including adequate education by institutions for the industry and instituting proper government policies and support for regulations that support implementation of sustainable construction practices to change the low sustainable construction (SC) practices adoption in most developing countries, as revealed in this research and corroborated by [36]. Therefore, government intervention in terms of policies is also of key importance since the research revealed that it is lacking because the practitioners are not really seeing sustainability construction practice as a gain owing to the longer payback period for sustainable resources or general poor perception of sustainable construction within the industry.

**Table 2: Extent of barriers in preventing the sustainable construction practices**

Barriers	Mean	Std. Dev	Rank
Poor sustainability education in academic institutions	3.70	1.10554	1
Lack of incentives for designers to facilitate sustainable design	3.64	1.20202	2
Ignorance of lifecycle cost benefits	3.58	1.06534	3
Regarded as low priority and other issues take priority	3.58	1.27271	4
No input tariff for generation of renewable energy	3.56	.98801	5
Resistance to cultural change in the industry	3.56	1.04756	6
Longer payback period for sustainable resources	3.54	1.10481	7
Lack of government policies/support	3.54	1.15837	8
Clients preference for the traditional materials	3.52	1.24300	9
Insufficient integration and link up within the industry	3.48	1.02966	10
Lack of commitment from professional bodies (such as NIA, NIOB, etc.)	3.48	1.14133	11
Poor awareness of the benefits of sustainability among the professionals	3.48	1.19325	12
Limited knowledge of sustainability practices among contractors	3.48	1.25915	13
Methods and data required for the comparison of drafts in terms of sustainability are missing	3.44	1.10390	14
Affordability	3.44	1.25786	15
Lack of supporting planning policy.	3.42	1.24056	16
Clients preference for the traditional building services	3.42	1.25674	17
Lack of client awareness	3.40	.98473	18
Inadequate innovative and sustainable materials	3.40	1.04447	19
Lack of proven alternative technologies to the prevailing technique	3.40	1.20605	20
Misunderstanding of sustainability as just green (planting of trees and flowers)	3.40	1.22268	21
Lack of sufficient time to address sustainability issues in projects	3.40	1.27128	22
Poor understanding of the benefits of sustainable construction	3.38	1.28535	23
Lackadaisical attitudes towards sustainability	3.38	1.11718	24
Non-consideration of sustainability in the building control (approval) process	3.36	1.21871	25
No adequate information on sustainability performance of materials and products	3.36	1.02020	26
Poor skills among construction craftsmen (bricklayers carpenter, etc.)	3.36	1.20202	27
Lack of general public Interest in Sustainability	3.36	1.26746	28
No professional role for initializing and leading sustainability	3.36	1.44614	29
General perception that sustainability means more expensive buildings	3.34	1.19949	30
Lack of Environmentally Sustainable materials	3.32	1.14486	31
Lack of practioners' awareness of sustainable design and construction practices	3.32	1.22993	32
New solutions are considered too risky to venture into	3.32	1.19663	33
Poor perception of sustainable construction within the industry	3.30	1.27525	34
Lack of supporting building regulations	3.28	1.10170	35
Lack of methods for setting sustainable building requirements	3.28	1.15540	36
Fear of higher investment cost	3.28	1.34900	37
Skill and labour shortage	3.24	1.24819	38

Paucity of exemplar projects	3.24	1.16446	39
Insufficient research and development in local context	3.24	1.16446	40
Fear of long-term warranties for sustainability building's	3.22	1.24381	41
Lack of business case understanding	3.22	1.14221	42
Designers not driving sustainability	3.20	1.20605	43
There is no adequate knowledge in order to consider potential new alternatives by designers	3.20	1.36330	44
Resistance to increment of higher capital cost when needed for facilitating sustainability practice	3.18	1.16671	45
Vagueness of the definition and requirements of sustainable design and construction.	3.16	1.22862	46
No method to verify compliance with sustainable building requirements	3.16	1.30825	47
Lack of assessment method that enables comparison of buildings in terms of sustainability	3.14	1.30283	48
Lack of financial resources	3.12	1.37275	49
Operational and end of life stages are not considered in design	3.06	1.19612	50
Lack of sustainability measurement codes	3.00	1.18918	51
It is not worthwhile to change the construction process due to sustainability consideration	2.98	1.26315	52
Lack of one labeling / measurement standard	2.98	1.32558	53
Buyers / clients do not state any requirement for sustainable buildings	2.96	1.39204	54
There is a lack of resources to supervise the realization of sustainable building requirements	2.96	1.22202	55
Lack of client demand	2.92	1.22003	56
Separation between capital budget and operational budget.	2.80	1.08246	57
Sustainable construction does not raise market values of buildings	2.62	1.15277	58

## 5. Conclusion and Recommendation

In developing countries like Nigeria, the importance of sustainability of construction can never be over emphasised as highlighted in this research. Developed countries would shrug up in intrepidity that they have been able to properly use the effect of sustainability in construction to cluster their growing economy. This study has focused on the barriers affecting the sustainable practices of construction in Nigeria. The Mean of the opinions of the respondents were analysed as to whether they strongly agree, agree, neutral, disagree or strongly disagree to each of the factor anticipated to be the barriers against the implementation of Sustainable Construction Practice (SCP). The data's gotten from this method of collation was statistically reviewed and analysed using a demographic statistical method using descriptive statistics in identifying the barriers to sustainable construction which include Poor sustainability education in academic institutions, Lack of incentives for designers to facilitate sustainable design, Ignorance of lifecycle cost benefit, Regarded as low priority and other issues take priority, Resistance to cultural change in the industry, No input tariff for generation of renewable energy, Longer payback period for sustainable resources, Lack of government policies/support and Clients preference for the traditional materials. These are the most important barriers that require prompt and timely attention for effective implementation of sustainable construction in Nigeria.

The revelation from the research has described the current construction practice in Nigeria as inadequate in terms of education to sustain the growth of the industry. Academic institutions will need to brace up for sustainability teaching in their curriculum in order to enhance their consciousness and

understanding before they graduate so that they can be vanguard of sustainable practice. This view was further echoed by the research participants that participated in the questionnaire. Some of the respondents' views can be summarized as the current knowledge on sustainable construction among practitioners in Nigeria are low and there is less emphasis on it in trainings in schools especially at the managerial level. This will in turn change the current lack of incentives for designers to facilitate sustainable design as revealed in the results. Lifecycle costing is another question raised in the research findings that could make one to ask whether life cycle costing is actually practised at all on projects in Nigeria particularly by Quantity Surveyors. The outlook of regarding sustainability practice as low priority and while other issues take priority over it is another important barrier that has made the practice of sustainability challenging particularly in considering this along with the resistance to cultural change in the industry where many refuse to change the current mode of doing things to the better and sustainable path. Government intervention in terms of policies is also of key importance since the research revealed that it is lacking because the practitioners are not really seeing sustainability construction practice as a gain owing to the longer payback period for sustainable resources and since the clients rarely change their preference for the traditional materials particularly as it aids sustainability. This could also be hinged on client's interest on profit as there is almost a neutral perception of raising market values of buildings just because of sustainable construction practice. Therefore, all the barriers are to be considered important as they affect the effective implementation of sustainable construction in Nigeria. There will be need for further research analysis to reassess any underlying causality among these barriers to see likely groupings and trimming down the barriers.

Therefore, for the industry to accurately tackle these barriers, incentives should be giving to upcoming private sectors to be able to flourish and explore their technological knowledge of construction, appropriate and trained professionals should be assigned to their respective jobs and not vice versa. Higher institutions including Universities and polytechnics will need to brace up for teaching sustainability by reviewing existing curriculum and come up with postgraduate courses and or professional courses in sustainability to checkmate the spread of disbelief in new ideas which is a deterrent to undergraduate and trained professionals. It is also important that professional courses should be observed through continuing professional development by professional bodies and administered to improve the technicality of each stakeholder in his/her field, new ideologies and instruments should be allowed for proper match up of the construction industry to the outside developing world. It can be concluded that adequate government intervention in terms of policy formulation, sustainable building regulations (including green design certification) and implementation coupled with financial grants while embracing an increased level of awareness to clients and construction stake holders would help yield positive results against the barriers affecting sustainable construction practice in Nigeria.

## References

- [1] Aigbavboa C, Ohioma I, and Zwane T 2017 Sustainable Construction Practices: "A Lazy View" of Construction Professionals in the South Africa Construction Industry *8th International Conference on Applied Energy* DOI: 10.1016/j.egypro.2017.03.743
- [2] Ahmed K, Hatira L, and Valva P 2014 The Construction Industry in Ghana, West Africa "How can the construction industry in Ghana become sustainable?". *School of Engineering, Karlskrona, Sweden: Blekinge Institute of Technology*.
- [3] Davies OOA and Davies IEE 2017 Barriers to implementation of sustainable construction techniques. *MAYFEB Journal of Environmental Science*, 2.
- [4] Olanipekun AO, Aje IO and Awodele OA 2014 Contextualising Sustainable Infrastructure Development in Nigeria *FUTY Journal of the Environment* **8 (1)**: 80 – 92.
- [5] Brundtland Gro Harlem 1987 *Our Common Future. Report of the World Commission on Environment and Development*. UN Document; 1987
- [6] Nwebo OE 2018 The African Union Agenda 2063 and the Imperative of Democratic Governance. *Law and Development Review*, **11(2)**: 259-276.
- [7] Ofori G 2012 *New perspectives on construction in developing countries*. Routledge, 2012.

- [8] Kibert CJ 2016 *Sustainable construction: green building design and delivery*. John Wiley & Sons.
- [9] Isa RB, Jimoh RA and Achuen E 2013 An overview of the contribution of construction sector to sustainable development in Nigeria. *Net Journal of Business Management*, **1(1)**: 1-6.
- [10] Femi OT 2014 Building Construction Technician Training: It's Relevance to Modern Construction Industry in Nigeria. *International Journal of Technology Enhancement and Emerging Engineering Research*, **2(3)**: 58-68.
- [11] Ikediashi DI, Ogunlana SO, Awodele OA and Okwuashi O 2012 An evaluation of personnel training policies of construction companies in Nigeria. *Journal of Human Ecology*, **40(3)**: 229-238.
- [12] Aroge, Stephen Talabi 2012 Employee's training and development for optimum productivity: The role of Industrial Training Fund (ITF), Nigeria. *Developing Country Studies* **2(4)**: 50-58.
- [13] Anand A and Kumar I 2016 Importance of Brundtland report in the protection of environment: a legal analysis. *South -Asian Journal of Multidisciplinary Studies (SAJMS)* **3 (3)**: 230
- [14] Aktas B and Ozorhon B 2015 Green building certification process of existing buildings in developing countries: cases from Turkey. *Journal of Management in Engineering*, **31(6)** 05015002.
- [15] Daniel EI, Oshineye O and Oshodi O 2018 Barriers to sustainable construction practice in Nigeria. In *Proceeding of the 34th Annual ARCOM Conference, Belfast, UK* (pp. 3-5).
- [16] Ruparathna R and Hewage K 2015 Sustainable procurement in the Canadian construction industry: current practices, drivers and opportunities. *Journal of Cleaner Production*, **109**, 305-314.
- [17] Ametepey O, Aigbavboa C and Ansah K 2015 Barriers to successful implementation of sustainable construction in the Ghanaian construction industry. *6th International Conference on Applied Human Factors and Ergonomics (AHFE 2015) and the Affiliated Conferences, AHFE 2015*
- [18] Darko A and Chan AP 2017 Review of barriers to green building adoption. *Sustainable Development*, **25(3)**: 167-179.
- [19] Ugochukwu and Onyekwena 2014 Participation of indigenous contractors in Nigerian public sector construction projects and their challenges in managing working capital. *International Journal of Civil Engineering, Construction and Estate Management*; **1(1)**: 1-21,
- [20] McMullen PR and Robert A Strong 1998 Selection of mutual funds using data envelopment analysis. *The Journal of Business and Economic Studies* **4**.1
- [21] Aghimien D, Aigbavboa C, Ngcobo N and Thwala W 2019 Barriers of Sustainable Construction Practices in Nigeria *Proceedings: 13th Built Environment Conference 2 - 3 September 2019, Durban, South Africa* pg 340 – 348.
- [22] Ogunde A, Olaolu O, Afolabi AO, Owolabi J and Ojelabi RA 2017 Challenges confronting construction project management system for sustainable construction in developing countries: Professionals perspectives (a case study of Nigeria). *Journal of Building Performance*, **8(1)**: 1-11.
- [23] Heidi E S Tomkiewicz 2011 Barriers to implementation of sustainable construction practices in the homebuilding industry: a case study of rochester, NY Unpublished MSc Thesis Presented to the Faculty of The Graduate College at the University of Nebraska, Lincoln, Nebraska
- [24] Darko A, Chan APC, Yang Y, Shan M, He BJ and Gou Z 2018 Influences of barriers, drivers, and promotion strategies on green building technologies adoption in developing countries: The Ghanaian case. *Journal of Cleaner Production*, **200**, 687-703.
- [25] Chan APC, Darko A, Olanipekun AO and Ameyaw EE 2018 Critical barriers to green building technologies adoption in developing countries: The case of Ghana. *Journal of cleaner production*, **172**, 1067-1079.
- [26] Wang W, Zhang S, Su Y and Deng X 2018. Key factors to green building technologies adoption in developing countries: The perspective of Chinese Designers. *Sustainability*, **10(11)**: 4135.

- [27] Yin S and Li B 2018 Transferring green building technologies from academic research institutes to building enterprises in the development of urban green building: A stochastic differential game approach. *Sustainable Cities and Society*, **39**, 631-638.
- [28] He B J 2019 Towards the next generation of green building for urban heat island mitigation: Zero UHI impact building. *Sustainable Cities and Society*, **50**, 101647.
- [29] Ayarkwa J, Acheampong A, Wiafe F, and Boateng BE 2017 Factors affecting the implementation of sustainable construction in Ghana: the architect's perspective. In ICIDA 2017-6th International Conference on Infrastructure Development in Africa (pp. 12-14).
- [30] AlSanad S 2015 Awareness, drivers, actions, and barriers of sustainable construction in Kuwait. *Procedia engineering*, **118**, 969-983.
- [31] Baron, N., & Donath, D. (2016, March). Learning from Ethiopia—A discussion on sustainable building. In *Proc. of SBE16 Hamburg International Conference on Sustainable Built Environment Strategies—Stakeholders—Success factors, Held from 7th to 11th March in Hamburg, Germany*.
- [32] Mahat N, Tah JH and Vidalakis C 2016 Adoption of sustainable construction in the Malaysian residential construction sector: a conceptual framework. In *4th International Conference on Advances in Agricultural, Biological & Ecological Sciences (AABES-16) Dec* (pp. 1-2).
- [33] Owusu EK, Chan AP and Ameyaw E 2019 Toward a cleaner project procurement: Evaluation of construction projects' vulnerability to corruption in developing countries. *Journal of cleaner production*, **216**, 394-407.
- [34] Häkkinen T and Belloni K 2011 "Barriers and drivers for sustainable building." *Building Research & Information* **39(3)**: 239-255.
- [35] Osaily NZr 2010 The key barriers to implementing sustainable construction in West Bank–Palestine." *UK: University of Wales* 63.
- [36] Aghimien DO, Adegbembo TF, Aghimien EI and Awodele OA 2018 Challenges of sustainable construction: a study of educational buildings in Nigeria. *International Journal of Built Environment and Sustainability*, **5(1)**.
- [37] Anzagira LF, Duah D and Badu E 2019 A conceptual framework for the uptake of the green building concept in Ghana. *Scientific African*, e00191.
- [38] Chan JH and Chan TY 2020 Current Trends of Developing Energy Efficiency Projects in the Building Sector of China. In *Sustainable Energy and Green Finance for a Low-carbon Economy* (pp. 227-244). Springer, Cham.
- [39] Salem O, Pirzadeh S, Ghorai S and Abdel-Rahim A 2014 Reducing environmental, economic, and social impacts of work-zones by implementing Lean Construction techniques. In *Annual Conference of the International Group for Lean Construction* **22**: 145-155).
- [40] Adegbembo TF, Bamişaye OP and Aghimien DO 2016 Assessment of lean construction practice in the Nigerian construction industry. In *Proceedings of the Joint International Conference (JIC), on 21st Century Habitat: Issues, Sustainability and Development* (pp. 21-24). Akure, Nigeria.
- [41] Durdyev S, Zavadskas EK, Thurnell D, Banaitis A and Ihtiyar A 2018 Sustainable construction industry in Cambodia: Awareness, drivers and barriers. *Sustainability*, **10(2)**: 392.
- [42] Ahn YH, Pearce AR, Wang Y and Wang G 2013 Drivers and barriers of sustainable design and construction: The perception of green building experience. *International Journal of Sustainable Building Technology and Urban Development*, **4(1)**: 35-45.
- [43] Shafii F, Arman Ali Z and Othman MZ 2006 Achieving sustainable construction in the developing countries of Southeast Asia.
- [44] Serpell A, Kort J, Vera S 2013 Awareness, actions, drivers and barriers of sustainable construction in Chile. *Technol. Econ. Dev. Econ.* **19**: 272–288.
- [45] Pitt M, Tucker M, Riley M. and Longden J, 2009 Towards sustainable construction: Promotion and best practices. *Construction Innovation: Information, Process, Management*, **9(2)**: 201-224.